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| APPLICATION NO.        | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.   | CONFIRMATION NO. |
|------------------------|-------------|----------------------|-----------------------|------------------|
| 10/808,941             | 03/25/2004  | Eghart Fischer       | P04,0090              | 6877             |
| 26574                  | 7590        | 12/13/2007           | EXAMINER              |                  |
| SCHIFF HARDIN, LLP     |             |                      | SUTHERS, DOUGLAS JOHN |                  |
| PATENT DEPARTMENT      |             |                      |                       |                  |
| 6600 SEARS TOWER       |             |                      | ART UNIT              | PAPER NUMBER     |
| CHICAGO, IL 60606-6473 |             |                      | 2615                  |                  |
|                        |             |                      | MAIL DATE             | DELIVERY MODE    |
|                        |             |                      | 12/13/2007            | PAPER            |

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

|                              |                        |                     |  |
|------------------------------|------------------------|---------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b> | <b>Applicant(s)</b> |  |
|                              | 10/808,941             | FISCHER, EGHART     |  |
|                              | <b>Examiner</b>        | <b>Art Unit</b>     |  |
|                              | Douglas Suthers        | 2615                |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 19 July 2004.
- 2a) This action is FINAL.                    2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1-27 is/are pending in the application.
  - 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 1-27 is/are rejected.
- 7) Claim(s) \_\_\_\_\_ is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 19 July 2004 is/are: a) accepted or b) objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) All    b) Some \* c) None of:
    1. Certified copies of the priority documents have been received.
    2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>07/19/04</u> .  | 6) <input type="checkbox"/> Other: _____                          |

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1

## DETAILED ACTION

2

3

4        The Art Unit location of your application in the USPTO has changed. To aid in  
5 correlating any papers for this application, all further correspondence regarding this  
6 application should be directed to Art Unit 2615.

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12

### *Drawings*

13        The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5)  
14 because they include the following reference character(s) not mentioned in the  
15 description:

16        Figure 2 shows item "MS2' " which is not found in the specification.

17        Figure 4 shows items "RMS", "ARMS", "ARMS1" and "ARMS2" which are not  
18 found in the specification.

19        Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to  
20 the specification to add the reference character(s) in the description in compliance with  
21 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the  
22 application. Any amended replacement drawing sheet should include all of the figures  
23 appearing on the immediate prior version of the sheet, even if only one figure is being  
24 amended. Each drawing sheet submitted after the filing date of an application must be  
25 labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37  
26 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be

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1 notified and informed of any required corrective action in the next Office action. The  
2 objection to the drawings will not be held in abeyance.

3

4 The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5)  
5 because they do not include the following reference sign(s) mentioned in the  
6 description:

7 Page 14 refers to "S1" and "S2" not found in any figure.

8 Page 15 refers to "RMS1" and RMS2" not found in any figure.

9 Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in  
10 reply to the Office action to avoid abandonment of the application. Any amended  
11 replacement drawing sheet should include all of the figures appearing on the immediate  
12 prior version of the sheet, even if only one figure is being amended. Each drawing sheet  
13 submitted after the filing date of an application must be labeled in the top margin as  
14 either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the  
15 changes are not accepted by the examiner, the applicant will be notified and informed of  
16 any required corrective action in the next Office action. The objection to the drawings  
17 will not be held in abeyance.

18

19 The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4)  
20 because reference character "S2" has been used to designate both the person of figure  
21 1 and signals on page 14. Corrected drawing sheets in compliance with 37 CFR  
22 1.121(d) are required in reply to the Office action to avoid abandonment of the

1 application. Any amended replacement drawing sheet should include all of the figures  
2 appearing on the immediate prior version of the sheet, even if only one figure is being  
3 amended. Each drawing sheet submitted after the filing date of an application must be  
4 labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37  
5 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be  
6 notified and informed of any required corrective action in the next Office action. The  
7 objection to the drawings will not be held in abeyance.

8

9

## ***Specification***

11        Claim 1 is objected to because of the following informalities: the claim refers to  
12      "a exteme value", which should most likely read "an extreme value". Appropriate  
13      correction is required.

14

15

## **Claim Rejections - 35 USC § 112**

17 The following is a quotation of the second paragraph of 35 U.S.C. 112:

18 The specification shall conclude with one or more claims particularly pointing out and distinctly  
19 claiming the subject matter which the applicant regards as his invention.

20  
21       Claim 27 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite  
22 for failing to particularly point out and distinctly claim the subject matter which applicant  
23 regards as the invention.

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1        Claim 27 recites the limitation "said acoustic environment analysis result". There  
2        is insufficient antecedent basis for this limitation in the claim. Perhaps claim 27 should  
3        be dependent on claim 26, not 25.

4

5

6                  ***Claim Rejections - 35 USC § 102***

7        The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that  
8        form the basis for the rejections under this section made in this Office action:

9                  A person shall be entitled to a patent unless –

10                 (b) the invention was patented or described in a printed publication in this or a foreign country or in public  
11                 use or on sale in this country, more than one year prior to the date of application for patent in the United  
12                 States.

13                 Claims 1-2, 5-8, 11-12, 15-23 are rejected under 35 U.S.C. 102(b) as being  
14                 anticipated by Nakazawa (US 6069961).

16

17                 Regarding claim 1, Nakazawa discloses a method for determining the direction of  
18                 incidence of an incoming audio signal from an acoustic source to a directional  
19                 microphone system, having at least two microphones, comprising the steps of:

20                 detecting said incoming audio signal with said at least two microphones (figure  
21                 3A, items 1a-7b) and, in each of said at least two microphones, producing an output  
22                 microphone signal therefrom (figure 4, signal from items 1a-7b);

23                 generating at least two directional microphone signals (from items 11a) by  
24                 combining the respective output microphone signals with respective weightings  
25                 (subtractors 11a weight one signal as positive one, the other minus one), the respective

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1 weightings defining a direction-dependent sensitivity distribution, having a minimum in  
2 one direction, for the respective directional microphone signals (figure 1B);  
3 assessing each of said directional microphone signals with respect to a quantity  
4 that indicates an influence, on the respective directional microphone signal, by the  
5 associated direction-dependent sensitivity distribution (11c); and  
6 comparing the respective quantities of the respective directional microphone  
7 signals with each other (20 finds minimum) to identify a quantity having a extreme value  
8 (minimum from 11d), and determining the direction of incidence of said incoming audio  
9 signal as being the direction at which the minimum of the direction-dependent sensitivity  
10 distribution for the directional microphone signal having said extreme value is located  
11 (direction is in direction of minimum).

12

13 Regarding claim 2, Nakazawa discloses comprising employing energy (items 11b  
14 and 11c represent a measure of the energy in the signal) in the respective directional  
15 microphone signals as said quantity, and determining the direction of the minimum of  
16 the direction-dependent sensitivity distribution having the least energy as being said  
17 direction of incidence.

18

19 Regarding claim 5, Nakazawa discloses comprising setting the respective  
20 weightings to minimize the sensitivity of the directional microphone system for a signal  
21 source located in a selected direction with respect to the directional microphone system  
22 (weightings are set so minimum level is found in selected direction).

1  
2       Regarding claim 6, Nakazawa discloses comprising selecting said weighting to  
3   embody an effect of an acoustic environment in which said directional microphone  
4   system is being used (weighting embodies all acoustic effects).

5  
6       Regarding claim 7, Nakazawa discloses comprising determining the respective  
7   weightings by measuring the sensitivity of the directional microphone system at a head  
8   or a head simulation (figure 1 shows measured sensitivity from microphones which are  
9   inherently simulations of human hearing, or head simulations).

10  
11      Regarding claim 8, Nakazawa discloses wherein each of said microphone  
12   signals has an amplitude and a phase, and comprising employing a weighting having at  
13   least one of an amplitude factor and a phase factor for correcting at least one of the  
14   amplitude or the phase of at least one of said microphone signals (weighting includes  
15   amplification factor of figure 1).

16  
17      Regarding claim 11, Nakazawa discloses comprising generating said directional  
18   microphone signals substantially simultaneously (all done simultaneously).

19  
20      Regarding claim 12, Nakazawa discloses comprising varying the respective  
21   weightings for two or more of said directional microphone signals to successively  
22   produce respective directional microphone signals having direction-dependent

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1 sensitivity distributions (weightings vary due to angle of bisector).

2

3       Regarding claim 15, Nakazawa discloses comprising weighting the respective  
4 microphone signals from the microphones in said directional microphone system in  
5 pairs to produce said directional microphone signal (1a-7a paired with 1b-7b).

6

7       Regarding claim 16, Nakazawa discloses wherein said incoming audio signal is a  
8 first incoming audio signal from a first source, and comprising detecting a second  
9 incoming audio signal from a second signal source with said microphones in said  
10 directional microphone system, and determining the direction of incidence of said  
11 second incoming audio signal from said quantity (first and second signals evaluated  
12 consecutively).

13

14       Regarding claim 17, Nakazawa discloses comprising assessing said quantities  
15 for said first and second incoming audio signals in a same frequency band by  
16 correlation (frequency band lower than LPF is used, highly correlated signals give lower  
17 value from subtractor).

18

19       Regarding claim 18, Nakazawa discloses comprising assessing said first and  
20 second incoming audio signals by correlation according to an echo relationship  
21 (peak/hold treats echoes similarly).

22

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1       Regarding claim 19, Nakazawa discloses comprising assessing said quantities  
2   for said first and second incoming audio signals in respectively different frequency  
3   bands by correlation (each frequency band lower than LPF is used, highly correlated  
4   signals give lower value from subtractor).

5

6       Regarding claim 20, Nakazawa discloses comprising assessing said first and  
7   second incoming audio signals by correlation according to an echo relationship  
8   (peak/hold treats echoes similarly).

9

10       Regarding claim 21, Nakazawa discloses comprising experimentally determining  
11   the direction of the minimum of each direction-dependent sensitivity distribution using  
12   an experimental signal source with said directional microphone system (figures 1, 2,  
13   and 3 contain experimental signal sources).

14

15       Regarding claim 22, Nakazawa discloses comprising determining the direction of  
16   the minimum of the direction-dependent sensitivity distribution by calculation with  
17   measured transfer functions (figure 2A).

18

19       Regarding claim 23, Nakazawa discloses an apparatus for determining a  
20   direction of incidence of an incoming audio signal comprising:  
21        a directional microphone system having at least two microphones (figure 3A,  
22   items 1a-7b) for detecting said incoming audio signal, each of said at least two

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1        microphones generating a microphone signal therefrom (figure 4, signal from items 1a-  
2        7b);  
3                weighting units for respectively weighting said microphone signals (subtractors  
4        11a weight one signal as positive one, the other minus one) for producing at least two  
5        directional microphone signals (from items 11a), the respective weightings defining a  
6        direction-dependent sensitivity distribution for each of said directional microphone  
7        signals (figure 1B);  
8                an assessment unit for assessing the respective directional microphone signals  
9        with respect to a quantity representing an influence of the direction-dependent  
10      sensitivity distribution on the directional microphone signal (11c); and  
11                a determination unit that identifies one of said directional microphone signals  
12      having an extreme value (20 finds minimum) of said quantity compared to the other  
13      directional microphone signals, and for determining the direction of incidence of said  
14      incoming audio signal as being a direction in which a minimum of the direction-  
15      dependent sensitivity distribution of said one of said directional microphone signals is  
16      located (direction is in direction of minimum).  
17  
18

19                ***Claim Rejections - 35 USC § 103***

20        The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all  
21      obviousness rejections set forth in this Office action:

22                (a) A patent may not be obtained though the invention is not identically disclosed or described as set  
23      forth in section 102 of this title, if the differences between the subject matter sought to be patented and  
24      the prior art are such that the subject matter as a whole would have been obvious at the time the

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1 invention was made to a person having ordinary skill in the art to which said subject matter pertains.  
2 Patentability shall not be negated by the manner in which the invention was made.

3  
4 Claims 3-4, and 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable  
5 over Nakazawa (US 6069961).

6

7 Regarding claim 3, Although Nakazawa does not expressly disclose employing a  
8 reciprocal of energy, using such is an equivalent variation. Nakazawa looks for a  
9 minimum energy which is associated with the maximum probability of being the correct  
10 direction. It would have been equivalent to look for a maximum of a reciprocal of the  
11 energy to be associated with the maximum probability. Therefore it would have been  
12 obvious to further comprise employing a reciprocal of energy of the respective  
13 directional microphone signals as said quantity, said reciprocal of said energy  
14 representing a probability that the direction of the minimum of the direction-dependent  
15 sensitivity distribution of the directional microphone signal associated with the reciprocal  
16 is said direction of incidence.

17

18 Regarding claim 4, Nakazawa discloses comprising combining the respective  
19 probabilities of the directional microphone signals to form a direction-resolved  
20 probability distribution, and determining the direction of incidence of said incoming audio  
21 signal from said probability distribution (chooses minimum signal which is maximum  
22 probability).

23

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1       Regarding claim 9, although Nakazawa does not expressly disclose storing said  
2 weighting as a frequency-dependent characteristic, it would have been obvious to do  
3 such. The motivation to do so would have been to allow for unit 20 to store information  
4 on the microphone array, such as that of figure 2A, for direction or filter coefficient  
5 calculations. Therefore at the time of invention, it would have been obvious to one of  
6 ordinary skill in the art to further comprise storing said weighting as a frequency-  
7 dependent characteristic.

8

9       Regarding claim 10, although Nakazawa does not expressly disclose comprising  
10 reading the respective weightings from a memory, it would have been obvious to do  
11 such. The motivation to do so would have been to allow for reconfigurable weights and  
12 reuse of components such as adders, thereby reducing costs and size. Therefore at the  
13 time of invention, it would have been obvious to one of ordinary skill in the art to further  
14 comprise reading the respective weightings from a memory.

15

16

17       Claims 13-14, and 24-27 rejected under 35 U.S.C. 103(a) as being unpatentable  
18 over Nakazawa (US 6069961) in view of Elko et al. (US 6584203 B2).

19

20       Regarding claim 13, Nakazawa does not disclose subband analysis.

21       Elko discloses wherein each of the microphone signals has a frequency range,  
22 and comprising subdividing each frequency range into a plurality of frequency bands

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1 (figure 8, items 820 and 822), each having a microphone signal component therein, and  
2 using said microphone signal components as said microphone signals (from 816).

3 At the time of the invention it would have been obvious to a person of ordinary  
4 skill in the art to use the subband analysis of Elko in the system of Nakazawa. The  
5 motivation for doing so would have been better model the transfer functions of the  
6 microphones and better isolate desired sound sources. Therefore, it would have been  
7 obvious to combine Elko with Nakazawa to obtain the invention as specified in claim 13.

8

9 Regarding claim 14, Nakazawa discloses comprising assessing the respective  
10 quantities of the respective directional microphone signals in at least two of said  
11 frequency bands (each of the bands is used via 824).

12

13

14 Regarding claim 24, Nakazawa does not expressly disclose subband processing.

15 Elko discloses comprising, for each of the microphones, a filter bank (figure 8,  
16 items 820,822) connected thereto for subdividing the microphone signal from the  
17 microphone signal connected thereto into a plurality of frequency bands each frequency  
18 band having an output at which a signal component of the microphone signal in that  
19 frequency band is present, with respective outputs of the respective filter banks in the  
20 same frequency band being connected in pairs to weighting units (806-816), said  
21 weighting unit comprising at least one of an amplitude unit (814) for varying an

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1 amplitude of the signal component and a phase unit (806) for shifting the phase of the  
2 signal component.

3 At the time of the invention it would have been obvious to a person of ordinary  
4 skill in the art to use the subband analysis of Elko in the system of Nakazawa. The  
5 motivation for doing so would have been better model the transfer functions of the  
6 microphones and better isolate desired sound sources. Therefore, it would have been  
7 obvious to combine Elko with Nakazawa to obtain the invention as specified in claim 24.

8

9 Regarding claim 25, Elko discloses wherein said weighting unit comprises both  
10 said amplitude units (814) and said phase units (806), and wherein said amplitude units  
11 and said phase unit operate jointly on each signal component.

12

13 Regarding claim 26, Elko discloses wherein an assessment unit comprises a  
14 plurality of assessment subunits (multiple LPF 818 as mentioned in summary and claim  
15 10) respectively operating in different ones of said frequency bands for assessing said  
16 quantity in the different frequency bands, and an analysis unit connected to said  
17 assessment subunits for generating, from the assessment of the quantities in the  
18 respectively different frequency bands, an acoustic environment analysis result ( $Y_{out}(t)$   
19 for each band).

20

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1 Regarding claim 27, Elko discloses wherein said analysis result generates said  
2 acoustic environment analysis result by a correlation analysis of a time response in the  
3 different frequency bands (difference signal represents correlation).

4

5

6 **Conclusion**

7 Any inquiry concerning this communication or earlier communications from the  
8 examiner should be directed to Douglas Suthers whose telephone number is (571)272-  
9 0563. The examiner can normally be reached on 8am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian Chin can be reached on (571)272-7848. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

13 Information regarding the status of an application may be obtained from the  
14 Patent Application Information Retrieval (PAIR) system. Status information for  
15 published applications may be obtained from either Private PAIR or Public PAIR.  
16 Status information for unpublished applications is available through Private PAIR only.  
17 For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should  
18 you have questions on access to the Private PAIR system, contact the Electronic  
19 Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a  
20 USPTO Customer Service Representative or access to the automated information  
21 system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

22

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